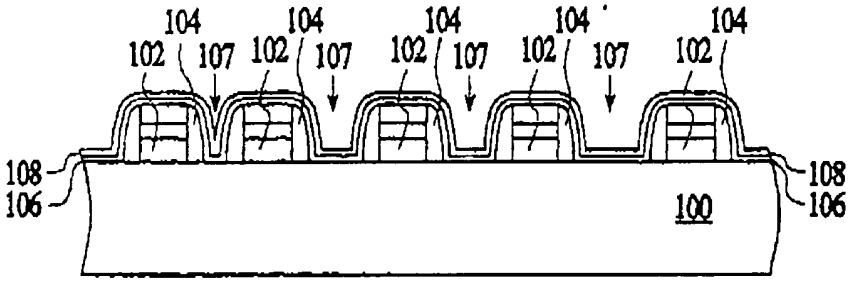
REMARKS

Claims 1-2, 4-6, and 10-23 are pending. No claims are amended by this response.

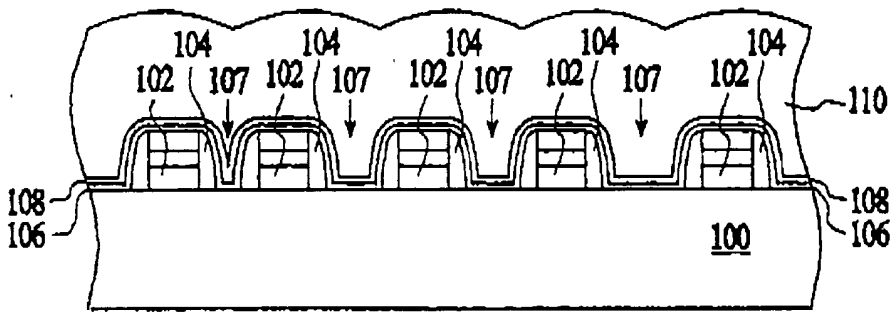
As an initial matter, paragraph **[0017]** of the specification has now been amended to correct a typographical error. Namely, the reference to "first layer 106" has now been corrected to refer to "first layer 108". This change is consistent with the remainder of the specification, and accordingly no new matter has been introduced.

Embodiments in accordance with the present invention relate to methods for filling with dielectric material, gaps or recesses in the surface of a workpiece. One specific embodiment utilizes a deposition process comprising at least two sequential stages, as described in connection with Figures 4B and 4C of the instant application, reproduced below.

> **[0017]** Referring to Figure 4B, in a first stage, a first layer 108 is deposited in the recesses 27 and over the substrate 100 . . . . The first layer 108 is formed using the bottom-up growth mechanism for smoothening the profile of the recesses 107 by filling any reentrant cavities. However, the recesses 107 are not entirely filled in this step and other sequential deposition steps may be used to fill the recesses 107. (Emphasis added)



[0019] Referring to Figure 4C, after deposition of the first layer 108, the process conditions are changed in a second process stage to deposit a second layer 110, also of silicon oxide material, to fill the recesses 107. In the second stage, deposition of the oxide material is continued, but the ratio of O_3 to TEOS in the deposition gas is gradually reduced, to deposit additional oxide material in a second layer 110 that fills the recesses 107. (Emphasis added)



As evidenced by the above text and figures, material is deposited within the recess or gap during both stages of a gap-filling method in accordance with the present invention. This aspect of the present invention was also emphasized in the summary of the invention.

[0009] A deposition method for filling recesses in a substrate comprises exposing the substrate to an energized deposition gas comprising first and second components, to deposit a first layer of a material in the recess, and thereafter, reducing the ratio of the first component to the second component, to deposit a second layer of the material over the first layer in the recess. (Emphasis added)

Deposition of material within the recess during the second stage is further recited in each of pending independent claims 1, 13, and 20:

1. A deposition method capable of filling recesses in a substrate, the method comprising:

(a) providing a substrate having recesses defining side walls and recess bottoms;

(b) exposing the substrate to an energized deposition gas comprising a first component comprising ozone and a second component, to deposit a first layer of a material in the recess at different rates over the side walls and recess bottoms; and

(c) reducing the ratio of the first component to the second component, to deposit a second layer of the material over the first layer in the recess. (Emphasis added)

13. A deposition method capable of filling recesses in a substrate, the method comprising:

(a) providing a substrate having recesses defining side walls and recess bottoms;

(b) exposing the substrate to an energized deposition gas comprising a first volumetric flow ratio of O_3 and TEOS, to deposit a first layer of silicon oxide in the recess at different rates over the side walls and recess bottoms; and

(c) reducing the volumetric flow ratio of the O_3 to the TEOS, to deposit a second layer of silicon oxide over the first layer in the recess. (Emphasis added)

20. A deposition method capable of filling recesses on a substrate, the recesses being between polysilicon gates and having sidewall portions covered with silicon nitride spacers, and wherein the silicon nitride spacers, the polysilicon gates and the other portions of the substrate, are covered with a silicon nitride liner, the method comprising:

(a) providing an energized deposition gas comprising O_3 and TEOS, to form a first layer of silicon oxide in the recess at different rates over side walls and recess bottoms of the recess; and

(b) reducing the volumetric flow ratio of O_3 to TEOS in the deposition gas, to fill the recesses with silicon oxide after the first layer is formed. (Emphasis added)

The above-emphasized language was present in these claims as originally filed.

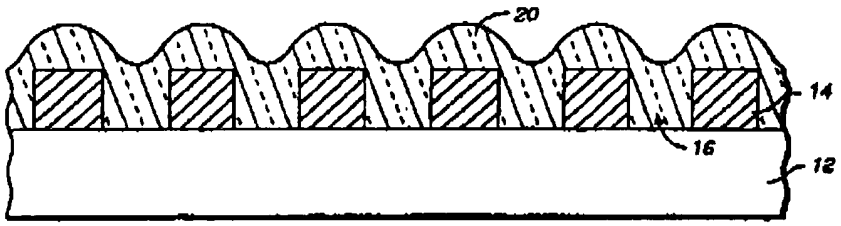
The Examiner has rejected all of the pending claims as either anticipated under 35 U.S.C. 102, or obvious under 35 U.S.C. 103, in light of U.S. patent no. 6,489,254 to Kelkar et al. ("the Kelkar patent"). These claim rejections are traversed as follows.

Like the pending claims, the Kelkar patent describes methods for forming dielectric material over a workpiece in multiple stages. However, the focus of the Kelkar patent is to provide a dielectric layer which exhibits desirable gap fill characteristics while promoting mobile ion gettering:

> [t]he method involves first depositing a layer of high-ozone undoped silicon dioxide film that provides the void-free gapfill characteristic and then depositing a low-ozone doped BPSG film that provides the gettering capability. This two layer insulating film provides the ability to have the gaps adequately filled between small or narrow lines without sacrificing good mobile-ion gettering properties. (Emphasis added; col. 2, line 65 - col. 3, line 4)

Consistent with this expressed goal, FIG. 2 of the Kelkar patent depicts a multistage deposition process where the first deposited layer completely fills the recess.

> With reference to FIG. 2, a layer of high ozone undoped silicon dioxide film 20 is deposited on top of the semiconductor substrate 12 and the polysilicon conductors 14. The high ozone undoped silicon dioxide film covers the polysilicon conductors 14 and fills the gaps 16 between the polysilicon conductors 14. (Emphasis added; col. 3, lines 57-62)

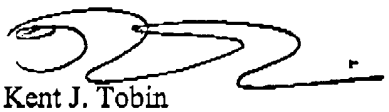


Nowhere does the Kelkar patent teach or even suggest utilizing a second deposited layer to complete filling of a gap or recess that has remained incompletely filled following an initial deposition stage. This approach of the Kelkar patent may be contrasted with the present invention, wherein deposition during a first stage smoothes the profile of reentrant cavities within the recess, thereby promoting bottom-up deposition at a higher rate to fill the recess during the second deposition stage. (See paragraph **[0017]**).

Because the art relied upon by the Examiner neither teaches nor suggests the recited elements of the claims, it is respectfully asserted that the pending claims are not invalid in light of these references. Continued rejection of the claims is improper and the Examiner should withdraw the outstanding rejections.

In view of the foregoing, Applicants believe all claims now pending in this Application are in condition for allowance. The issuance of a formal Notice of Allowance at an early date is respectfully requested. If the Examiner believes a telephone conference would expedite prosecution of this application, please telephone the undersigned at 650-326-2400.

Respectfully submitted,



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